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(54) Abstract Title
Bacteriacidal, ozonated moisture supply apparatus

(57) Moisture supply apparatus for and associated method of delivering substantially sterile airborne moisture into the interior of a refrigerated area comprises airborne moisture generation means (7), such as a fog or mist generator or air spray humidifier; water supply means (1) arranged to supply water to the airborne moisture generation means (7); delivery means (9) arranged to deliver airborne moisture generated by the airborne moisture generation means (7) into the interior of a refrigerated area; and means (5) arranged to ozonate water being supplied to the airborne moisture generation means (7) from the water supply means (1) with a concentration of ozone which is sufficient to treat bacteriacidally not only the water supplied to the airborne moisture generation means (7) and the so-generated airborne moisture delivered into the refrigerated area interior but also the interior surfaces of the apparatus with which the ozonated water and airborne moisture come into contact.

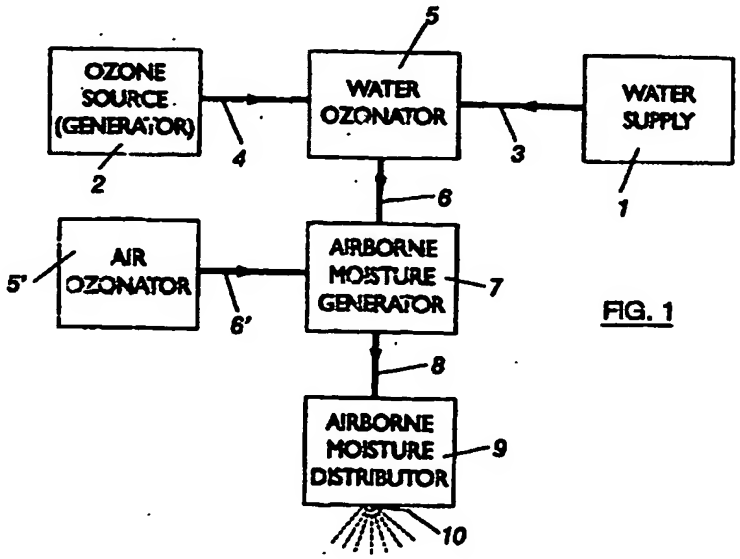

FIG. 1

GB 2 326 095 A

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

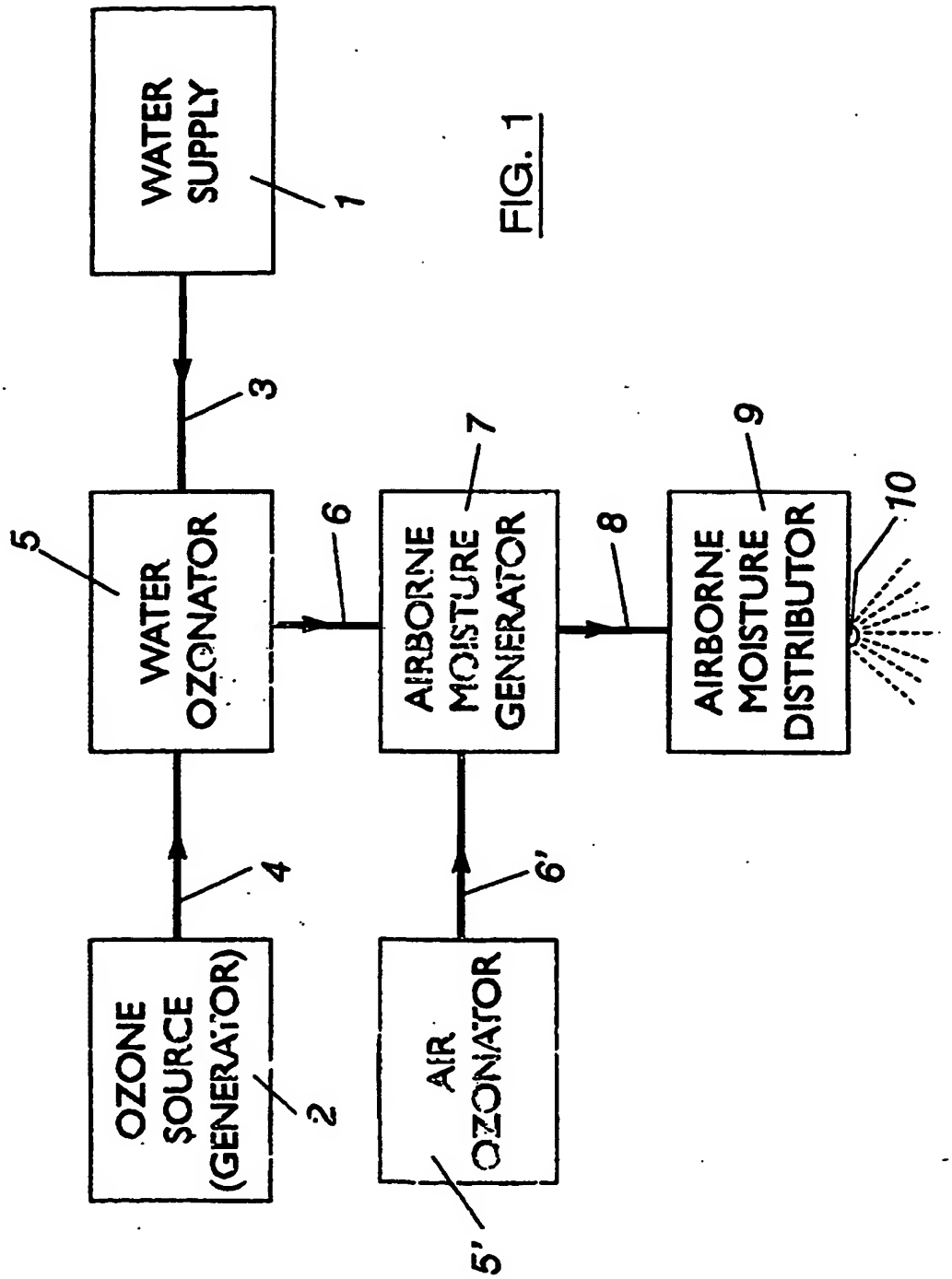
WATER SUPPLY
1
3
5
WATER OZONATOR
6
AIRBORNE MOISTURE GENERATOR
7
8
AIRBORNE MOISTURE DISTRIBUTOR
9
10
4
OZONE SOURCE (GENERATOR)
2
6'
AIR OZONATOR
5'

FIG. 1

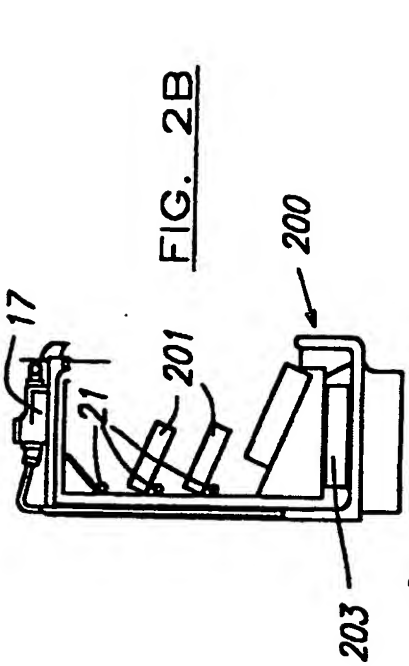

FIG. 2B

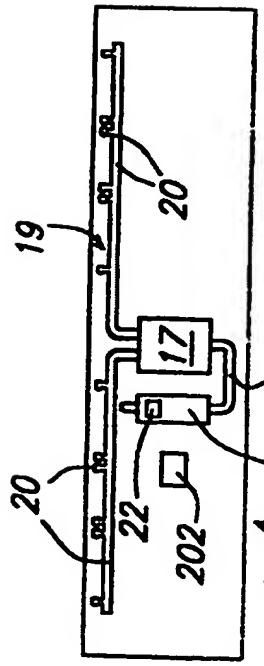

FIG. 2A

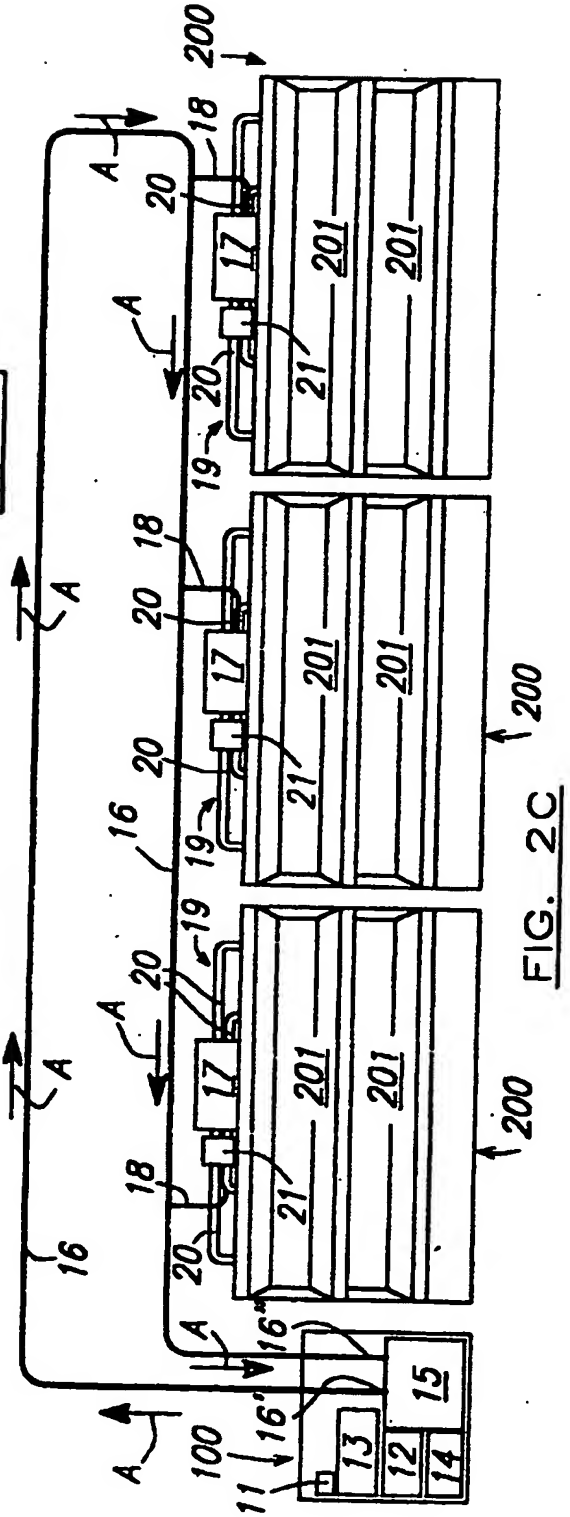

FIG. 2C

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BACTERIACIDAL, OZONATED AIRBORNE MOISTURE SUPPLY APPARATUS AND METHOD

DESCRIPTION

This invention relates to bacteriacidal, ozonated moisture supply apparatus for and an associated method of delivering sterile airborne moisture to the interior of, say, a refrigerated food or other product display cabinet, a refrigerated store room or other similar refrigerated area, the apparatus being of the type comprising, inter alia, an airborne moisture generator, such as a fog or mist generator or air spray humidifier, connected to means for distributing or otherwise delivering so-generated airborne moisture into the refrigerated area.

Some known forms of this type of apparatus comprise means for bacteriacidally treating the water used to generate airborne moisture before it is distributed or otherwise delivered into the refrigerated area.

One form of such known bacteriacidal treatment means comprises a source of UV light to which the water used to generate airborne moisture is exposed prior to its delivery into the moisture generator. That UV light source can also be provided within the airborne moisture generator and/or the airborne moisture delivery means in any suitable manner.

Another form of such known bacteriacidal treatment means comprises a source of ozone, such as an ozone generator, which, again, can be associated with the airborne moisture generator and/or the

airborne moisture delivery means, to mix a bacteriacidal concentration of ozone with the so-generated airborne moisture prior to its being distributed or otherwise delivered into the refrigerated area.

With both these known forms of bacteriacidal treatment of the so-generated airborne moisture, it has been found that, although the bacteria in the water used to generate the airborne moisture are killed to a significant extent, the interior surfaces of the components of the moisture supply apparatus, particularly those of the airborne moisture generator and associated components downstream thereof, eventually become contaminated with bacteria, because the bacteriacidal effect of the UV light or the ozone concentration within the airborne moisture is insufficient to kill all the bacteria within the apparatus and, also, because such components are recontaminated with bacteria in air introduced into the apparatus for distributing the so-generated airborne moisture.

Accordingly, it is an object of the present invention to provide bacteriacidal, ozonated airborne moisture supply apparatus and an associated method which overcome, or at least substantially reduce, the disadvantages associated with the known types of moisture supply apparatus discussed above.

In accordance with a first aspect of the invention, there is provided moisture supply apparatus for delivering substantially sterile airborne moisture into the interior of a refrigerated area, which apparatus comprises:

(1) airborne moisture generation means, such as a fog or mist generator or air spray humidifier;

(2) water supply means arranged to supply water to said airborne moisture generation means;

(3) delivery means arranged to deliver airborne moisture generated by said airborne moisture generation means into the interior of a refrigerated area; and

(4) means arranged to ozonate water being supplied to said airborne moisture generation means from said water supply means with a concentration of ozone which is sufficient to treat bacteriacidally not only the water supplied to said airborne moisture generation means and the so-generated airborne moisture delivered into the refrigerated area interior but also the interior surfaces of the apparatus with which the ozonated water and airborne moisture come into contact.

Preferably, the apparatus further comprises air ozonation means arranged to ozonate air being pumped by, say, a fan into the airborne moisture generation

means where the ozonated air is mixed with the ozonated water from the water ozonation means, to generate ozonated, and hence bacteriacidally sterile, airborne moisture for subsequent delivery into the refrigerated area interior by the delivery means. In this manner, ozone-depleted water from the water ozonation means is re-ozonated, to ensure that the airborne moisture generated in the airborne moisture generation means is substantially fully ozonated just prior to its being delivered into the refrigerated area interior.

Such moisture supply apparatus in accordance with the first aspect of the invention defined above, may also include means arranged to recirculate back to said water ozonating means for re-ozonation any residual water not supplied to said airborne moisture generation means. In this manner, and because the ozone in the ozonated water usually decomposes to molecular oxygen within approximately 10 minutes, any residual water can be re-ozonated and recirculated.

In an embodiment of the moisture supply apparatus in accordance with the first aspect of the invention, the ozonated airborne moisture delivery means is arranged to deliver ozonated airborne moisture to the interiors of a plurality of refrigerated areas, in which case, each such area may have associated with it air ozonation means, as discussed above, for supplying ozonated air to the airborne moisture generation means.

In accordance with a second aspect of the invention, there is provided a method of bacteriacidally treating apparatus arranged to deliver

airborne moisture to the interior of a refrigerated area and including airborne moisture generation means, such as a fog or mist generator or air spray humidifier, water supply means arranged to supply water to said airborne moisture generation means, and delivery means arranged to deliver airborne moisture generated by said airborne moisture generation means into the refrigerated area, which method comprises generating airborne moisture in said airborne moisture generation means from water supplied thereto from said water supply means and delivering the so-generated airborne moisture into the interior of the refrigerated area via said airborne moisture delivery means, wherein the water supplied to said airborne moisture generation means is ozonated to provide a concentration of ozone therein which is sufficient to treat bacteriacidally not only the supply of water to said airborne moisture generation means and the so-generated airborne moisture delivered into the refrigerated area but also the interior surfaces of the apparatus with which the ozonated water and airborne moisture come into contact.

Preferably, air, which may be pumped, for example, by a fan, to the airborne moisture generation means where it is mixed or otherwise combined with the ozonated water being supplied thereto to thus generate ozonated, and hence bacteriacidally sterile, airborne moisture for delivery into the refrigerated area interior, is also ozonated in order to re-ozonate ozone-depleted water fed to the airborne moisture generation means, thereby ensuring that the so-generated airborne moisture is substantially fully ozonated just prior to its being delivered into the refrigerated area interior.

In this manner, substantially all the interior surfaces of the apparatus, for example those of the water ozonating means and of the other apparatus components, such as the airborne moisture generation means and airborne moisture delivery means, as well as any piping or ducting connecting such means together, are treated bacteriacidally, to eliminate substantially any surface bacteria, thereby preventing, or at least substantially inhibiting, any bacterial growth during operation of the inventive apparatus and associated method.

Any residual water not supplied to the airborne moisture generating means, may be recirculated for re-ozonation and subsequent recirculation, as discussed above.

Also, ozonated airborne moisture may be delivered by the delivery means to the interiors of a plurality of refrigerated areas, in which case, ozonated air may be supplied to the airborne moisture generation means at each such area.

The invention also provides a point of sale, refrigerated display cabinet associated with or incorporating the inventive moisture supply apparatus in accordance with the first aspect of the invention.

A third aspect of the invention resides in moisture supply apparatus for delivering substantially sterile airborne moisture into the interior of at least one refrigerated area, which apparatus comprises:

(i) water supply means;

(ii) airborne moisture generation means arranged to be supplied with water from said water supply means;

(iii) means arranged to ozonate water being supplied from said water supply means to said airborne moisture generation means;

(iv) delivery means arranged to deliver ozonated, and hence substantially sterile, airborne moisture generated by said airborne moisture generation means into the interior of said at least one refrigerated area; and

(v) means arranged to recirculate back to said water ozonating means for re-ozonation any residual water not supplied to said airborne moisture generation means.

Preferably, an airborne moisture generation means may be associated with the or each refrigerated area, in which case, the apparatus may further comprise air ozonation means arranged to ozonate air being pumped by, say, a fan into the or each airborne moisture generation means where the ozonated air is mixed or otherwise combined with the ozonated water from the water ozonation means, to generate ozonated, and hence bacteriacidally sterile, airborne moisture for subsequent delivery into the refrigerated area interior by the or each delivery means. In this manner, ozone-depleted water from the water ozonation means can be re-ozonated, to ensure that the airborne moisture generated in the airborne moisture generation means is substantially fully ozonated just prior to its being delivered into the or each refrigerated area

interior.

Thus, and as the ozone in the ozonated water usually decomposes to molecular oxygen within approximately 10 minutes, any residual water can be re-ozonated and recirculated to the airborne moisture generation means. This is particularly important when several refrigerated area interiors are located remotely from each other and are supplied with ozonated, and hence substantially sterile, water which can then be converted into ozonated airborne moisture, subject optionally to further ozonation or re-ozonation by ozonated air, for subsequent delivery into the refrigerated area interiors.

In an embodiment of moisture supply apparatus in accordance with the third aspect of the invention defined above, the water ozonation means is arranged to ozonate water from the water supply means with an ozone concentration which is sufficient to treat bacteriacidally not only at least some of the water supplied to said airborne moisture generation means and the so-generated ozonated airborne moisture delivered into the interior of the at least one refrigerated area but also the interior surfaces of the apparatus with which the ozonated water and airborne moisture come into contact, particularly if optional ozonated air is used in the airborne moisture generation means.

A fourth aspect of the invention resides in a method of bacteriacidally treating apparatus arranged to deliver airborne moisture to the interior of at least one refrigerated area and including airborne moisture generation means, such as a fog or mist

generator or air spray humidifier; water supply means arranged to supply water to said airborne moisture generation means, and delivery means arranged to deliver airborne moisture generated by said airborne moisture generation means into at least one refrigerated area, which method comprises generating airborne moisture in said airborne moisture generation means from water being supplied thereto from said water supply means and delivering the so-generated airborne moisture into the interior of said at least one refrigerated area via said airborne moisture delivery means, wherein the water being supplied to said airborne moisture generation means from said water supply means is ozonated and any residual water not supplied to said airborne moisture generation means, is recirculated for re-ozonation.

Thus, and as ozone in the ozonated water usually decomposes to molecular oxygen within approximately 10 minutes, any residual water can be re-ozonated and recirculated to the delivering means.

Preferably, air, which may be pumped, for example, by a fan, to the or each airborne moisture means where it is mixed or otherwise combined with the ozonated water to thus generate ozonated, and hence bacteriacidally sterile, airborne moisture for delivery into the or each refrigerated area interior, is also ozonated in order to re-ozonate ozone-depleted water being fed to the or each airborne moisture generation means, thereby ensuring that the so-generated airborne moisture is substantially fully ozonated just prior to its being delivered into the corresponding refrigerated area interior.

associated with the refrigeration system of the or each refrigerated area. Then, the airborne moisture generator means may be refilled with freshly-ozonated water, to sterilise bacteriacidally the interior surfaces thereof, and that water may then also be drained away. In this manner, any associated drain or drainage system through which the ozonated water is drained, is also subjected to bacteriacidal sterilisation.

The airborne moisture generation means can be used to generate ozonated airborne moisture as, say, a fog or mist in a manner which represents an improvement in previously-known airborne moisture generation means, Previously, such known airborne moisture generation means generate ozonated airborne moisture by firstly ozonating a reservoir of water and then the so-ozonated water is subsequently converted into ozonated airborne moisture, such as a fog or mist. This known arrangement tends to be inefficient, in that, firstly, at least some of the ozone in the ozonated water is lost, for example, by decomposition into molecular oxygen, as it is being passed to and through the airborne moisture generation means and, secondly, further ozone is lost from the ozonated water as it is converted into airborne moisture at, say, the spray nozzle or other moisture generating component of the airborne moisture generation means.

Thus, a fifth aspect of the invention resides in a method of generating ozonated airborne moisture, which method comprises producing airborne moisture from a supply of water, ozonating a gas, such as air, and mixing the so-produced airborne moisture and so-ozonated gas intimately together, to provide ozonated

Preferably, the water from the water supply means is ozonated with a concentration of ozone sufficient to treat bacteriacidally not only the water supplied to the airborne moisture generation means and the so-generated airborne moisture delivered to the or each refrigerated area but also the interior surfaces of the associated apparatus with which the ozonated water and airborne moisture come into contact, especially, but not exclusively, when ozonated air is used as an option for the airborne moisture generation means.

In all four aspects of the invention defined above, as well as any modifications thereof, the moisture supply apparatus may be purged with ozone during shut-down, that is to say, when the airborne moisture generation means is inoperative and airborne moisture is not being supplied to the interior of the refrigerated area(s) via the delivery means. Such purging effectively sterilises bacteriacidally the interior surfaces of the apparatus to eliminate, or at least substantially reduce, any bacterial growth on those surfaces during such shut-down. The purging ozone is preferably provided by circulating ozonated water, whilst ozonated air, which is otherwise combined with ozonated water in the airborne moisture generation means, may also be used to sterilise the interior surfaces of the refrigerated area(s) whilst the apparatus is shut-down, namely when the airborne moisture generation means is inoperative.

Also during the purging operation discussed above, initially the airborne moisture generation means may be rendered inoperative and any excess water, whether still ozonated or not, can be drained therefrom, for example, via a drain which may be that

airborne moisture.

In this manner, the ozone in the ozonated gas is readily transferred to the airborne moisture, which may be in the form of minute droplets of water of, say, 5μ in size, to provide airborne moisture having a rich concentration of ozone therein.

Accordingly, a sixth aspect of the invention is directed to apparatus for generating ozonated airborne moisture, comprising means arranged to produce airborne moisture from a supply of water, means arranged to ozonate a gas, such as air, and means arranged to mix the so-produced airborne moisture and so-ozonated gas intimately together, to provide, in use of the apparatus, ozonated airborne moisture.

The airborne moisture and ozonated gas mixing means may be of any suitable form, for example, a mixing chamber, whilst the airborne moisture production means may also be of any suitable form, such as a nozzle.

It is to be appreciated that ozonated airborne moisture generation means in accordance with the sixth aspect of the invention may, be employed as the airborne moisture generation means of the apparatus in accordance with the first and/or third aspect of the invention defined above. Similarly, the method of generating ozonated airborne moisture in accordance with the fifth aspect of the invention may be used in the method in accordance with the second and/or fourth aspects of the invention defined above.

In order that the invention may be more fully

understood, preferred embodiments of bacteriacidal, ozonated airborne moisture supply apparatus in accordance therewith and for performing the inventive methods, will now be described by way of example and with reference to the accompanying drawings in which:

Figure 1 is a diagrammatic representation of one embodiment of airborne moisture supply apparatus; and

Figures 2A and 2C are respective diagrammatic top plan, side elevational and front elevational views of another embodiment of airborne moisture supply apparatus.

Referring, therefore, to Figure 1 of the drawing, bacteriacidal, ozonated airborne moisture supply apparatus comprises a supply 1 of mains or demineralised water and a source of ozone in the form of an ozone generator 2. The water supply 1 and ozone generator 2 are connected by respective piping 3, 4 to a water ozonator 5 in which the ozone from the generator 2 is mixed with the water from the supply 1 to a substantial concentration.

The now-ozonated water is fed, via piping 6 to an airborne moisture generator 7 in the form of a fog or mist generator or humidifier, which is supplied with ozonated air from an air ozonator 5' via a pipe 6' and where the ozonated water and air are mixed or otherwise combined to generate ozonated airborne moisture in, say, the form of a mist or fog. This airborne moisture is generated from the ozonated water and air supplied to the generator 7 by any suitable means, for example, ultrasonically.

Thence, the so-generated ozonated airborne moisture is fed, via further piping 8, to an airborne moisture distributor or other delivery means 9 having a nozzle 10 or other suitable outlet for delivering the airborne moisture into a refrigerated area, such as, a refrigerated product display cabinet (not shown).

In the water ozonator 5, the ozone from the generator 2 is bubbled through or otherwise mixed with the water from the supply 1 to such an extent that the resulting concentration of the ozone within the water supplied to the airborne moisture generator 7 and airborne moisture distributor 9, as well as the respective connecting piping 6, 8, is sufficient to treat bacteriacidally not only the ozonated water but also the interior surfaces of the apparatus with which the ozonated water comes into contact, such interior surfaces being, inter alia, those of the water ozonator 5, piping 6, and, to a certain extent, the airborne moisture generator 7, piping 8, airborne moisture distributor 9 and associated outlet 10.

At the airborne moisture generator 7, the now at least partially ozone-depleted water is re-ozonated by ozonated air from the air ozonator 5'.

Thus, any bacteria on the interior surfaces of those apparatus components 5 to 10 with which the ozonated water and/or air comes into contact, are substantially eradicated, thereby providing an effectively sterile environment in the apparatus, bearing in mind also that any bacteria in the water and/or subsequently-generated airborne moisture, will also be killed.

The ozone in the airborne moisture delivered into the refrigerated area from the distributor outlet 10 will revert rapidly, for example within a few minutes, into molecular oxygen in the airborne moisture in the refrigerated area.

Such ozonated airborne moisture maintains a level of sterility greater than that which has previously been possible, without the need to use chemical disinfectants which might otherwise contaminate or taint the food or other products on display in the refrigerated area.

Referring now to Figures 2A and 2C, a second embodiment of bacteriacidal, ozonated airborne moisture supply apparatus comprises a supply 11 of mains or demineralised water and a source of ozone in the form of an ozone generator 12. The water supply 11 is connected via suitable piping (not shown) to a water filter 13 and a water demineralisation tank 14, both in series and downstream of the water supply 11.

The demineralisation tank 14 and the ozone generator 12 are connected, via piping (again not shown), to a water ozonation tank 15 in which the ozone from the generator 2 is mixed with the demineralised water from the tank 14 to a substantial concentration.

The water supply 11, ozone generator 12, water filter 13, water demineralisation tank 14 and water ozonation tank 15, as well as the associated connecting piping, are housed in a unit 100 which may also house any suitable electrical and/or electromechanical control means for the apparatus.

The output of the water ozonation tank 15 is connected to one end 16' of an ozonated water circulation pipe 16 whose other end 16'' is connected to a return inlet of the tank 15, whereby ozonated water from that tank 15 can be passed, for example, by pumping, through the circulation pipe 16 in the direction of the arrows A.

Connected to the return run of the circulation pipe 16 is a plurality, in this case three, of T-pipes 18 which, in turn, are connected to respective airborne moisture generators 17, in this case fog generators, associated with respective refrigerated product display cabinets indicated generally at 200, in which food products are displayed on shelves 201 in corresponding refrigerated areas thereof.

Each cabinet 200 is also provided with an air ozonator 21 to which is passed air, by means of a fan (not shown), from the interior of the cabinet 200, via an air filter 22, and in which the so-filtered air is ozonated for subsequent passing to the fog generator 17, via piping 23, where it is mixed, or otherwise combined, with the ozonated water supplied from the pipe 16. That ozonated water supplied to the fog generator 17 will be at least partially depleted of ozone, whereby the ozonated air serves to provide additional ozone to the fog generator 17, such that the fog generator therein for subsequent delivery to the interior of the cabinet 200, is substantially fully ozonated and thus substantially sterile.

Each airborne moisture generator 17 and air ozonator 21, as well as other standard electrical components, such as a refrigeration coil 203, of each

display cabinet 200, is provided with an electrical power supply shown diagrammatically at 202.

Each fog generator 17 communicates with the interior of the refrigerated area of the corresponding display cabinet 200 via an ozonated fog distribution system 19 comprising a plurality of pipes 20 through which the ozonated fog is delivered to the refrigerated area interior of the display cabinet 200 by means of nozzles 21.

Thus, any ozonated water passing along the return run of the circulation pipe 16 which is not fed to the fog generator 17, is returned to the water ozonation tank 15 to whose return inlet the other end 16'' of that pipe 16 is connected.

Because the display cabinets 200 are remote from the water ozonation tank 15, the ozonated water circulation pipe 16 is comparatively long and ozone in the circulating water normally decomposes to molecular oxygen within about ten minutes, the return of the unused water, which has not been fed to the fog generators 17, to the ozonation tank 15 replenishes that ozone-depleted water with ozone for subsequent recirculation to the fog generators 17 via the ozonated water circulation pipe 16.

The airborne moisture/fog generator 7, 17 of one or both embodiments of apparatus may be one in accordance with the sixth aspect of the invention defined above, namely, one in which ozonated air is mixed intimately with airborne moisture/fog.

As discussed above, the two embodiments of

moisture supply apparatus may be purged with ozone during their shut-down, when airborne moisture/fog generator 7, 17 is inoperative and, thus, airborne moisture/fog is not being supplied to the interior of the refrigerated area(s) via the delivery means. Such purging effectively sterilises bacteriacidally the interior surfaces of the apparatus to eliminate, or at least substantially reduce, any bacterial growth on those surfaces during shut-down. The purging ozone is supplied by the ozonated water circulating through the pipe 16 and, also, by the air ozonator 5', 21 which, although the airborne moisture/fig generator 7, 17 is inoperative, is still operative. In this manner, the interior surfaces of the refrigerated area(s) are also sterilised bacteriacidally whilst the apparatus is shut-down.

During that purging operation, initially the airborne moisture/fog generator 7, 17 may be rendered inoperative and any excess water, whether still ozonated or not, can be drained therefrom, for example, via the drain of the associated refrigeration system of the or each refrigerated display cabinet 300. Then the generator 7, 17 can be refilled with freshly-ozonated water, for bacteriacidal sterilisation purposes, and that water can then also be drained away. Thus, any associated drainage systems through which the ozonated water is drained, is also subjected to bacteriacidal sterilisation.

Thus, it can be seen that the invention provides various forms of apparatus and associated methods which maintain at a minimum the levels of bacteria within the associated systems, during both operation and shut-down.

CLAIMS

1. Moisture supply apparatus for delivering substantially sterile airborne moisture into the interior of a refrigerated area, which apparatus comprises:

(1) airborne moisture generation means, such as a fog or mist generator or air spray humidifier;

(2) water supply means arranged to supply water to said airborne moisture generation means;

(3) delivery means arranged to deliver airborne moisture generated by said airborne moisture generation means into the interior of a refrigerated area; and

(4) means arranged to ozonate water from said water supply means with a concentration of ozone which is sufficient to treat bacteriacidally not only the water supplied to said airborne moisture generation means and the so-generated airborne moisture delivered into the refrigerated area interior but also the interior surfaces of the apparatus with which the ozonated

water and airborne moisture come into contact.

2. Apparatus in accordance with claim 1 including means arranged to recirculate back to said water ozonating means for re-ozonation any residual water not supplied to said airborne moisture generation means.

3. Apparatus in accordance with claim 1 or 2, wherein said ozonated airborne moisture delivery means is arranged to deliver ozonated airborne moisture to the interiors of a plurality of refrigerated areas.

4. Apparatus in accordance with claim 1, 2, or 3 further comprising air ozonation means arranged to ozonate air being passed to said airborne moisture generation means where, in use, the ozonated air is mixed with the ozonated water from said water ozonation means.

5. Apparatus in accordance with claim 4, wherein said airborne moisture generation means comprises means arranged to produce airborne moisture and means arranged to mix the ozonated air and so-produced airborne moisture intimately together.

6. A method of bacteriacidally treating apparatus arranged to deliver airborne moisture to the interior of a refrigerated area and including airborne moisture generation means, such as a fog or mist generator or air spray humidifier, water supply means arranged to supply water to said airborne moisture generation means, and delivery means arranged to deliver airborne moisture generated by said airborne moisture

generation means into the refrigerated area, which method comprises generating airborne moisture in said airborne moisture generation means from water supplied thereto from said water supply means and delivering the so-generated airborne moisture into the interior of the refrigerated area via said airborne moisture delivery means, wherein the water supplied to said airborne moisture generation means is ozonated to provide a concentration of ozone therein which is sufficient to treat bacteriacidally not only the supply of water to said airborne moisture generation means and the so-generated airborne moisture delivered into the refrigerated area but also the interior surfaces of the apparatus with which the ozonated water and airborne moisture come into contact.

7. A method in accordance with claim 6, wherein any residual water not supplied to the airborne moisture generating means, is recirculated for re-ozonation and subsequent recirculation.

8. A method in accordance with claim 6 or 7, wherein ozonated airborne moisture is delivered by said delivery means to the interiors of a plurality of refrigerated areas.

9. A method in accordance with claim 6, 7 or 8, wherein air being passed to said airborne moisture generation means is ozonated and then mixed with ozonated water in said generation means.

10. A method in accordance with claim 9, wherein airborne moisture is produced from the water in said airborne moisture generation means and the ozonated air is subsequently mixed intimately with the so-

produced airborne moisture.

11. Moisture supply apparatus for delivering substantially sterile airborne moisture into the interior of at least one refrigerated area, which apparatus comprises:

(i) water supply means;

(ii) airborne moisture generation means arranged to be supplied with water from said water supply means;

(iii) means arranged to ozonate water supplied from said water supply means to said airborne moisture generation means;

(iv) delivery means arranged to deliver ozonated, and hence substantially sterile, airborne moisture generated by said airborne moisture generation means into the interior of said at least one refrigerated area; and

(v) means arranged to recirculate back to said water ozonating means for re-ozonation any residual water not supplied to said airborne moisture generation means.

12. Apparatus in accordance with claim 11, wherein said water ozonation means is arranged to ozonate water from the water supply means with an ozone concentration which is sufficient to treat bacteriacidally not only the water supplied to said airborne moisture generation means and the so-generated ozonated airborne moisture delivered into

the interior of the at least one refrigerated area but also the interior surfaces of the apparatus with which the ozonated water and airborne moisture come into contact.

13. Apparatus in accordance with claim 11 or 12 further comprising air ozonation means arranged to ozonate air being passed to said airborne moisture generation means where, in use, the ozonated air is mixed with the ozonated water from said water ozonation means.

14. Apparatus in accordance with claim 13, wherein said airborne moisture generation means comprises means arranged to produce airborne moisture and means arranged to mix the ozonated air and so-produced airborne moisture intimately together.

15. A method of bacteriacidally treating apparatus arranged to deliver airborne moisture to the interior of at least one refrigerated area and including airborne moisture generation means, such as a fog or mist generator or air spray humidifier; water supply means arranged to supply water to said airborne moisture generation means, and delivery means arranged to deliver airborne moisture generated by said airborne moisture generation means into at least one refrigerated area, which method comprises generating airborne moisture in said airborne moisture generation means from water supplied thereto from said water supply means and delivering the so-generated airborne moisture into the interior of said at least one refrigerated area via said airborne moisture delivery means, wherein the water supplied to said airborne moisture generation means from said water supply means

is ozonated and any residual water not supplied to said airborne moisture generation means, is recirculated for re-ozonation.

16. A method in accordance with claim 15, the water from said water supply means is ozonated with a concentration of ozone sufficient to treat bacteriacidally not only the water supplied to the airborne moisture generation means and the so-generated airborne moisture delivered to the or each refrigerated area but also the interior surfaces of the associated apparatus with which the ozonated water and airborne moisture come into contact.

17. A method in accordance with claim 15 or 16, wherein air being passed to said airborne moisture generation means is ozonated and then mixed with ozonated water in said generation means.

18. A method in accordance with claim 17, wherein airborne moisture is produced from the water in said airborne moisture generation means and the ozonated air is subsequently mixed with the so-produced airborne moisture.

19. Moisture supply apparatus in accordance with any of claims 1 to 5 and 11 to 14 including ozone generation means arranged to purge the apparatus.

20. A point of sale, refrigerated display cabinet associated with or incorporating moisture supply apparatus in accordance with any of claims 1 to 5, 11 to 14 and 19.

21. A method in accordance with any of claims 6 to 10

and 15 to 18, wherein the apparatus is purged with ozone during shut-down thereof.

22. Moisture supply apparatus for delivering substantially sterile airborne moisture into the interior of a refrigerated area, substantially as hereinbefore described with reference to the accompanying drawings.

23. A method of bacteriacidally treating apparatus arranged to deliver airborne moisture to the interior of a refrigerated area, substantially as hereinbefore described.

24. A method of generating ozonated airborne moisture, which method comprises producing airborne moisture from a supply of water, ozonating a gas, such as air, and mixing the so-produced airborne moisture and so-ozonated gas intimately together, to provide ozonated airborne moisture.

25. Apparatus for generating ozonated airborne moisture, comprising means arranged to produce airborne moisture from a supply of water, means arranged to ozonate a gas, such as air, and means arranged to mix the so-produced airborne moisture and so-ozonated gas intimately together, to provide, in use of the apparatus, ozonated airborne moisture.

26. Apparatus in accordance with claim 25, wherein said airborne moisture and ozonated gas mixing means comprises a mixing chamber.

27. A method of generating ozonated airborne moisture, substantially as hereinbefore described.

28. Apparatus for generating ozonated airborne

reference to the accompanying drawings.

The Patent Office

Application No:	GB 9805481.0	**Examiner:**	Gavin Dale
Claims searched:	1-23	**Date of search:**	7 October 1998

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.P): A5G (GAB, GD); F4H (H2L); F4V (VFC)

Int Cl (Ed.6): A47F 3/04; A61L 2/20, 9/015; F24F 3/14, 3/16, 6/12

Other: Online: WPI, PAJ

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
X,E	GB 2319330	(NORMAN PENDRED) See page 7 paragraph 2 to page 8 paragraph 1	1 & 11
A	GB 2162424A	(ESKIL LEANNANT KARLSON) See page 1 lines 31-34	

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
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Application No:	GB 9805481.0	**Examiner:**	Gavin Dale
Claims searched:	24-28	**Date of search:**	7 October 1998

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Further Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

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X,E	GB 2319330	(NORMAN PENDRED) See page 7 paragraph 2 to page 8 paragraph 1	24 & 25
X,E	GB 2317688A	(NORMAN PENDRED) See Fig 1 & page 12 paragraphs 2 and 3	24 & 25
X	WPI Abstract Accession Number 92-091526 and JP04033658	(TEISA SANGYO KK) See WPI abstract and Japanese Patent Office abstract	24 & 25

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